Motives for Simultaneous Alcohol and Marijuana Use among Young Adults

Megan E. Patrick[1,*], **Anne M. Fairlie**[2], and **Christine M. Lee**[2]

[1]Institute for Social Research, University of Michigan

[2]Department of Psychiatry and Behavioral Sciences, University of Washington

Abstract

The majority of young adults who use alcohol and marijuana sometimes use the two substances simultaneously. Understanding why young adults engage in simultaneous alcohol and marijuana (SAM) use may inform interventions and help offset negative consequences. To date, research has not yet examined motives for SAM use. The current study tested a 26-item measure of motives for SAM use in a community sample of young adults to identify the factor structure and to evaluate associations of subscales of SAM motives with alcohol and marijuana motives and substance use. Young adults from the Seattle metropolitan area (N = 286; 58% female, 67% White/Caucasian) were asked about their motives for using alcohol, marijuana, and SAM as well as their use of alcohol and marijuana and related consequences in the past month. Exploratory factor analysis with promax rotation identified four factors to characterize motives for SAM use: (1) *conformity* (8 items, α=.87, e.g., "to fit in with a group I like," "pressure from others"), (2) *positive effects* (6 items, α=.88, e.g., "cross-faded effects are better," "to get a better high") (3) *calm/coping* (3 items, α=.77, e.g., "to calm me down," "to cope with anxiety"), and (4) *social* (5 items, α=.78, e.g., "because it is customary on special occasions," "as a way to celebrate"). Results revealed that alcohol, marijuana, and SAM motives were moderately correlated. Even after controlling for alcohol or marijuana motives, SAM motives were associated with SAM use and marijuana use/ consequences (but not alcohol use/consequences).

Young adults exhibit peak lifetime levels of substance use; the majority of young adults (81%) used alcohol and about a third (34%) used marijuana in the past year (Johnston et al., 2016). This pervasive use of alcohol and marijuana places young adults at particular risk for SAM use and consequences. The majority of people who use both alcohol and marijuana sometimes use them at the same time (Briere et al., 2011; Subbaraman & Kerr, 2015), so

that the health risks associated with alcohol (Hingson et al., 2001, 2002, 2005; NIAAA, 2006; Yi et al., 2004) and marijuana (Volkow et al., 2014) use overlap. Engaging in simultaneous alcohol and marijuana (SAM) use likely increases overall risks compared to using either alone (Briere et al., 2011). SAM users drink significantly more alcohol and have higher levels of alcohol-related consequences compared to alcohol only users (Subbaraman & Kerr, 2015). Documented consequences of SAM use include legal, interpersonal, physical, and mental health problems (Briere et al., 2011; Midanik et al., 2007; Pape et al., 2009). Of great public health concern are the risks of motor vehicle collisions, which occur at higher incidence among SAM users compared to alcohol-only or marijuana-only users (Ramaekers et al., 2004; Sewell et al., 2009; Terry-McElrath et al., 2014). There is debate about whether SAM use occurs incidentally because of the relatively high prevalence of alcohol and marijuana use, or whether it is intentional, based for instance on desired effects of simultaneous ingestion (Barnwell & Earleywine, 2006). Motives for substance use are proximal risk factors associated with extent of use. Distinct drinking motives are associated with problematic alcohol use and later consequences (i.e., coping motives) and with high levels of acute risk (i.e., enhancement motives; Cooper, 1994; Cooper et al., 1995; Cox & Klinger, 1988). Motives for marijuana use also distinguish levels of use and consequences (Lee et al., 2007; Patrick et al., 2011; Simons et al., 1998, 2005). Motive–use associations and endorsement of motives may distinguish those who use both alcohol and marijuana (Simons et al., 2005), and users of both substances can discriminate between alcohol and marijuana motives (Simons et al., 1998; 2000). SAM use may be partly based on motivations to achieve unique effects (e.g., to increase effect of one substance by using both substances together), but these motives for SAM use have not yet been examined.

Previous research has shown that more frequent SAM use is related to greater use of alcohol or marijuana to increase the effects of other drugs (Terry-McElrath et al., 2013). Expectancies for SAM use have shown added predictive power of use beyond separate alcohol and marijuana expectancies (Barnwell & Earleywine, 2006). To date, research has yet to examine why young adults engage in SAM use, despite the fact that SAM use is common and associated with increased negative consequences.

The Current Study

Research questions for the current study were: (1) What is the factor structure of the measure of motivations for SAM use?, (2) How do the SAM motives subscales relate to motives for alcohol use and motives for marijuana use?, and (3) Are SAM motives associated with SAM, alcohol, and marijuana use and their consequences, above and beyond motives for alcohol or marijuana use?

Method

Sample

A community sample of 779 young adults (ages 18–23 at time of recruitment) living in the greater Seattle metropolitan area participated in a longitudinal study for 24 consecutive months. Recruitment occurred from January 2015 to January 2016. Data for the present manuscript are from surveys completed in May 2016 and range from month 4 to month 15 in

the 24-month sequence. The subsample completing the May 2016 survey (N=676) had a mean age of 21.35 years (SD=1.83); was 59.50% female; 76.11% heterosexual; 59.19% White/Caucasian, 18.83% Asian American, and 21.98% other race. All procedures were approved by the local University Institutional Review Board and a federal Certificate of Confidentiality was obtained.

Procedures

Recruitment procedures included advertising (e.g., social networking sites), posting flyers, and conducting community outreach. An online survey determined eligibility (i.e., age 18–23, residence within 60 miles of University of Washington, valid email address, past-year alcohol use, and willingness to come to local study office), followed by a 1½-hour in-person appointment including age verification (via driver's license or picture ID), consent for longitudinal study, and an online baseline assessment. In total, 779 young adults completed the baseline assessment and were considered enrolled in the longitudinal study.

Each month participants received a series of reminders (e.g., email) to complete the survey between the 1st and 10th of the month. In addition to a core set of monthly measures, periodic measures varied across months to maintain engagement. Of the 779 original participants, 778 began the monthly surveys.

The present analyses use data collected in May 2016 with a response rate of 84.45% (N=657). Just under half (n=311, or 47.34%) reported simultaneous alcohol and marijuana use at least once in their lifetime. Complete data on the SAM motives items (for inclusion in the factor analysis) were available for 286 participants (92.0% of those who reported lifetime SAM use and were eligible to answer these questions).

Measures

Demographics were assessed at baseline and included age (coded as 18–20 = 0; 21 and older = 1); biological sex (0 = Female, 1 = Male); sexual identity status (coded as 0 = did not identify as heterosexual, 1 = identified as heterosexual); student status (0 = not a student, 1 = 4-year college, 2-year college, or graduate student), highest parental education (coded as 0 = less than a Bachelor's degree, 1 = bachelor's degree or higher. Race was coded using two dummy codes comparing participants who identified as "Asian or South Asian" and those who indicated any other race to the reference group "Caucasian or White."

Alcohol use motives were assessed with the 28-item Drinking Motives Questionnaire – Revised (DMQ-R, Grant et al., 2007). The DMQ-R assesses the extent to which the individual uses alcohol for four different types of reasons (social [5 items, α=.75], enhancement [5 items, α=.82], coping [13 items, α=.92], and conformity [5 items, α=.79] reasons), using a response scale from 1 = "Almost never/never" to 5 = "Almost always/always."

Marijuana use motives were assessed with the 36-item Comprehensive Marijuana Motives Questionnaire (CMMQ, Lee et al., 2009). The CMMQ assesses the extent to which the individual uses marijuana for twelve different reasons, with three items each (enjoyment [α=.82], conformity [α=.53], coping [α=.76], experimentation [α=.80], boredom [α=.82],

alcohol-related [α=.81], celebration [α=.84], altered perception [α=.92], social anxiety [α=.86], low risk [α=.83], sleep [α=.86], and availability [α=.78], using a scale of 1 = "Almost never/never" to 5 = "Almost always/always."

Simultaneous alcohol and marijuana use motives were assessed with a new measure developed based on review of the literature of alcohol and marijuana use motives, review of the perceived effects of SAM use, and qualitative data collected in the screening survey. For the open-ended screening data, the first and last author independently reviewed the open-ended responses. Young adults listed up to five reasons they "use alcohol and marijuana together, that is, so their effects overlapped." The two authors each came up with a preliminary list of motivations and examples within each motivation and then discussed their lists to reach consensus. Combined, broad motivation topics included conformity/peer pressure, better effects when combined, increasing creative/altered state, coping reasons, social/party facilitation, and because of boredom.

To develop a preliminary measure, the three authors of this manuscript then identified items matching each broad motivation category based on qualitative responses or previously published alcohol and marijuana use motives (e.g., Grant et al., 2007; Lee et al., 2009). The measure assessed the broad categories identified in our review of the open-ended responses and included 26 items with response options from 1 = "Almost never/never" to 5 = "Almost always/always." Participants were asked "Thinking about when you typically use alcohol and marijuana at the same time, that is so their effects overlap, how often would you say you use them at the same time for each of the following reasons?" The present manuscript describes the psychometric analysis of this measure of motivations for SAM use.

Simultaneous alcohol and marijuana (SAM) use was assessed with a single item asking, "How many of the times when you used marijuana or hashish during the last month did you use it at the same time as alcohol—that is, so that their effects overlapped?" using a response scale from 0 = "Not at all" to 4 = "Every time" (adapted from Monitoring the Future; Miech et al., 2017). Responses were dichotomized to reflect "0 times" in the past 30 days versus "At least once."

Number of drinks consumed per week was assessed using the 7-item Daily Drinking Questionnaire (Collins et al., 1985; Kivlahan et al., 1990). For each day of the week, participants were asked to report "How much alcohol, on average, (measured in number of drinks), did you drink on each day of a typical week?" using an open-ended response format and a maximum response of "25 or more drinks." A sum score of the seven items was used.

Alcohol-related consequences were assessed with the 24-item Brief Young Adult Alcohol Consequences Questionnaire (B-YAACQ; Kahler et al., 2005). Participants were asked to indicate whether or not they experienced each item in the past month, and a sum score of the 24 items was used.

Marijuana use was measured with a single open-ended item asking participants to report on how many days in the past 30 days they used marijuana.

Marijuana consequences were assessed with a 26-item measure (Lee et al., in progress). Participants were asked "How many times did these things happen to you while you were using marijuana (or because of your marijuana use) during the past 30 days?" using a response scale from 0 = "0 times" to 4 = "More than 10 times." Responses were dichotomized to reflect "0 times" in the past 30 days versus "1 or more times" and then a sum score of the 26 dichotomized items was calculated.

Plan of Analysis

To address Research Question 1 (to identify the factor structure of the 26-item SAM motives measure), we conducted exploratory factor analysis with promax rotation. We used a combination of indicators to determine the appropriate number of factors, including scree plots, Velicer's MAP test, and parallel analysis (O'Connor, 2000; Velicer et al., 2000). To determine the final factor structure, we used the following criteria: (1) retain items with loadings of .40 or greater; (2) exclude items with complex loadings (i.e., difference of .20 or greater when item loaded on multiple factors); (3) retain factors with at least three items; (4) retain multi-item factors with subscale alphas of .70 or greater; and (5) ensure factors were interpretable.

To address Research Question 2 (to examine associations among motives for alcohol use, marijuana use, and SAM use), we examined descriptive statistics from each set of measures and correlations between them. To address Research Questions 3 (associations of SAM motives with SAM use, alcohol use, marijuana use, and consequences after controlling for motives for alcohol and marijuana use), we used a series of regression models. The first set of models examined alcohol use motives and SAM use motives as predictors of SAM use, drinks per week, and alcohol consequences. The second set of models examined marijuana use motives and SAM use motives as predictors of SAM use, days used marijuana, and marijuana consequences. Logistic regression was used to predict any SAM use from which we report odds ratios (ORs) that describe how the odds of any SAM use differ based on the predictor. Given the relatively high prevalence of SAM use (42% of the sample), supplementary regression models were conducted using procedures described by Zou (2004) to obtain relative risk (RR) estimates that describe how the prevalence of any SAM use differs based on the predictor. Models testing alcohol use and marijuana use as outcomes were estimated with negative binomial regression. All regression models included the following covariates: age 21 or older, sex, sexual identity status, student status, race, and parent education.

Results

Exploratory Factor Analysis for SAM Motives (Research Questions 1)

The following four correlated factors were identified (Table 1): Factor 1 reflected motives for SAM use pertaining to "*conformity*" (8 items, α=.87). Items with high loadings on this factor included "to fit in with a group I like" and "pressure from others." Factor 2 reflected motives for SAM use pertaining to experiencing "*positive effects*" (6 items, α=.88). Items with high loadings on this factor included "cross-faded effects are better" and "to get a better high." Factor 3 reflected "*calm/coping*" motives for SAM use (3 items, α=.77). Items with

high loadings on this factor included "to calm me down" and "to cope with anxiety." Factor 4 reflected "*social*" motives for SAM use (5 items, α=.78). Items with high loadings on this factor included "because it is customary on special occasions" and "as a way to celebrate." Four of the 26 items (see Table 1) did not load on any of the four factors and were, therefore, not retained in subsequent analyses.

Descriptive Statistics and Correlations (Research Questions 2)

Of the alcohol motives, endorsement was highest for the enhancement and social subscales (Table 2). Of the marijuana motives, endorsement was highest for the enjoyment, availability, and altered perception subscales. Of the SAM motives, endorsement was highest for the positive effects and social subscales. SAM motives subscales were generally correlated with the alcohol motives and marijuana motives subscales with most correlations below .40. Conformity SAM motives exhibited the fewest significant associations with the alcohol and marijuana motives subscales.

Regressions for Motives Predicting Substance-related Outcomes (Research Question 3)

Regression models including alcohol motives and SAM motives as independent variables are shown in Table 3. For any SAM use in the past month, higher conformity SAM motives were significantly associated with lower odds of SAM use in the past month and higher social SAM motives were significantly associated with greater odds of SAM use in the past month. A supplementary regression model used to generate relative risk (RR; results shown in the fourth column) confirmed these findings.

For drinks per week, higher coping alcohol motives, higher enhancement alcohol motives, and lower conformity SAM motives were associated with consuming more drinks per week in the past month. Being male and identifying as heterosexual were also associated with consuming more drinks per week. For alcohol consequences, higher social alcohol motives, coping alcohol motives, and enhancement alcohol motives were associated with more alcohol consequences in the past month. SAM motives were not associated with alcohol consequences.

Regression models including marijuana motives and SAM motives as independent variables are shown in Table 4. For any SAM use in the past month, lower experimentation marijuana motives and higher alcohol-related marijuana motives were associated with greater odds of SAM use. Lower conformity SAM motives and higher calm/coping SAM motives were associated with greater odds of SAM use. In the supplementary model, RR results confirmed that alcohol-related marijuana motives and calm/coping SAM motives were associated with greater risk. However, other results differed slightly. The RR for SAM use did not significantly differ by experimentation marijuana motives or conformity SAM motives. In contrast, the RR differed by low risk marijuana motives (although the OR was not significant). Discrepancies result from different model assumptions, therefore the findings regarding alcohol-related marijuana motives and calm/coping SAM motives are more robust.

For days used marijuana, higher boredom marijuana motives, higher sleep marijuana motives, and lower availability marijuana motives were each associated with more days of marijuana use in the past month. Lower conformity SAM motives, higher calm/coping SAM

motives, and higher social SAM motives were each associated with more days of marijuana use. For marijuana consequences, higher conformity marijuana motives and higher boredom marijuana motives, as well as higher calm/coping SAM motives were associated with more marijuana consequences in the past month. Covariates were not significant in these models.

Discussion

The current study is the first to examine motives for substance use specific to using marijuana and alcohol at the same time. These SAM motives overlap conceptually with alcohol motive and marijuana motive subscales documented in previous research. In particular, conformity SAM motives involve using alcohol and marijuana at the same time to fit in or be liked, because of direct peer pressure, or to avoid being teased. These motives are similar to conformity motives for alcohol use (e.g., "because your friends pressure you to drink," "to be liked"; Cooper, 1994) and for marijuana use (e.g., "because you felt pressure from others who do it"; Lee et al., 2009). The positive effects factor of SAM motives is a combination of the hypothesized factors of attaining better effects when alcohol and marijuana are combined and enhancing a creative or altered state. Some of these items are similar to alcohol motives for enhancement (e.g., "to get high" and "because you like the feeling"; Cooper, 1994) and marijuana motives to achieve altered perception (e.g., "to allow you to think differently"; Lee et al., 2009). Coping motives for SAM use are similar to coping motives for alcohol use (e.g., "to forget about your problems"; Cooper, 1994), coping motives for marijuana use (e.g., "to forget your problems"; Lee et al., 2009), sleep motives for marijuana use ("to help you sleep"; Lee et al., 2009), and social anxiety reasons for marijuana use ("because it makes you more comfortable in an unfamiliar situation"; Lee et al., 2009). Finally, social SAM motives are conceptually similar to social motives for alcohol use (e.g., "to celebrate a special occasion with friends," "to be sociable"; Cooper, 1994) and celebration motives for marijuana use ("to celebrate"; Lee et al., 2009). However, despite the conceptual overlap and in some cases very similarly-worded items, correlations for these matched subscales were only moderate (.20 to .56). In fact, motives for SAM use are not made redundant by either alcohol use motives or marijuana use motives.

Comparing the extent to which SAM motives are associated with behavior, even after controlling alcohol and/or marijuana motives, we found that conformity SAM motives were associated with lower odds of SAM use, which is consistent with conformity motives for alcohol use being associated with lower frequency and quantity of alcohol use (Cooper, 1994; Cooper et al., 1995; Patrick et al., 2011). Social SAM motives and calm/coping SAM motives were each associated with greater odds of SAM use, consistent with previous findings regarding alcohol and marijuana motives (Bonn-Miller et al., 2007; Cooper, 1994; Lee et al., 2009; Patrick et al., 2011). Beyond specific motives for alcohol use or marijuana use, there appear to be distinct motives for combining alcohol and marijuana. Previous research has demonstrated that the association between enhancement motives and alcohol use was stronger among those who reported alcohol (but not marijuana) use in the past 12 months as compared to those who reported use of both substances in the past 12 months (Simons et al., 2005). Consistent with this finding, our analyses showed that enhancement motives for alcohol, but not social motives for SAM, were associated with alcohol use and consequences in the past month. Furthermore, the current study demonstrates that even after

accounting for the substance-specific motives, SAM motives help explain who is most likely to engage in SAM use and marijuana use, in particular.

Limitation and Future Directions

This study has several limitations. First, only participants who reported using alcohol or marijuana that particular month were asked to report alcohol motives and marijuana motives, respectively, resulting in a maller sample size for the marijuana motives; SAM motives were asked of all lifetime SAM users, resulting in heterogeneity in recency of use. Second, SAM-specific consequences were not examined. Third, the 26 items in the factor analysis were generated from qualitative data and previous research; additional types of SAM motives may have been identified if sufficient items had been available to form a viable factor (e.g., a single item assessed boredom as a SAM use motive). Fourth, the outcome indicators for alcohol use (typical drinks per week) and marijuana use (number of days in the past 30) were not identical. Finally, the sample was a community sample of young adults in the Seattle area who reported alcohol use in the past year at time of recruitment; results may not generalize to other contexts where, for example, recreational marijuana use remains illegal. Future research regarding motives for SAM use is needed, with specific attention regarding why alcohol and marijuana are combined and the perceived and actual consequences of this simultaneous use. In particular, future studies should address how SAM motives differ across substance use contexts and the extent to which SAM motives are prospectively associated with use and consequences. Clinically, future research could utilize SAM motivations for young adult interventions either as a target of intervention or by tailoring interventions based on motivations for use. There is a need to understand whether interventions based on an understanding of the particular motives for co-use are needed and could be effective in curbing substance-related negative consequences among young adults.

Acknowledgments

References

Barnwell SS, Earleywine M. Simultaneous alcohol and cannabis expectancies predict simultaneous use. Substance Abuse Treatment, Prevention, and Policy. 2006; 1:1–29. DOI: 10.1186/1747-597X-1-29

Briere FN, Fallu JS, Descheneaxu A, Janosz M. Predictors and consequences of simultaneous alcohol and cannabis use in adolescents. Addictive Behaviors. 2011; 36:785–788. DOI: 10.1016/j.addbeh.2011.02.012 [PubMed: 21429672]

Collins RL, Parks GA, Marlatt GA. Social determinants of alcohol consumption: The effects of social interaction and model status on the self-administration of alcohol. Journal of Consulting and Clinical Psychology. 1985; 53:189–200. [PubMed: 3998247]

Cooper ML. Motivations for alcohol use among adolescents: Development and validation of a four-factor model. Psychological Assessment. 1994; 6:117–128. DOI: 10.1037/1040-3590.6.2.117

Cooper ML, Frone MR, Russell M, Mudar P. Drinking to regulate positive and negative emotions: A motivational model of alcohol use. Journal of Personality & Social Psychology. 1995; 69:990–1005. DOI: 10.1037/0022-3514.69.5.990 [PubMed: 7473043]

Cox WM, Klinger E. A motivational model of alcohol use. Journal of Abnormal Psychology. 1988; 92:168–180. DOI: 10.1037/0021-843X.97.2.168

Grant VV, Stewart SH, O'Connor RM, Backwell E, Conrod PJ. Psychometric evaluation of the five-factor Modified Drinking Motives Questionnaire-Revised in undergraduates. Addictive Behaviors. 2007; 32(11):2611–2632. DOI: 10.1016/j.addbeh.2007.07.004 [PubMed: 17716823]

Hingson R, Heeran T, Winter M, Wechsler H. Magnitude of alcohol-related mortality and morbidity among U.S. college students ages 18–24: Changes from 1998–2001. Annual Review of Public Health. 2005; 26:259–279. DOI: 10.1146/annurev.publhealth.26.021304.144652

Hingson R, Heeran T, Zakocs R. Age of drinking onset and involvement in physical fights after drinking. Pediatrics. 2001; 108(4):872–877. DOI: 10.1542/peds.108.4.872 [PubMed: 11581438]

Hingson RW, Heeren T, Zakocs RC, Kopstein A, Wechsler H. Magnitude of alcohol-related mortality and morbidity among U.S. college students ages 18–24. Journal of Studies on Alcohol. 2002; 63(2):136–144. DOI: 10.15288/jsa.2002.63.136 [PubMed: 12033690]

Johnston, LD., O'Malley, PM., Bachman, JG., Schulenberg, JE., Miech, RA. Monitoring the Future national survey results on drug use, 1975–2015: Volume II, college students and adults ages 19–55. Ann Arbor: Institute for Social Research, The University of Michigan; 2016. http://www.monitoringthefuture.org/pubs/monographs/mtf-vol2_2015.pdf

Kahler CW, Strong DR, Read JP. Toward efficient and comprehensive measurement of the alcohol problems continuum in college students: The Brief Young Adult Alcohol Consequences Questionnaire. Alcoholism: Clinical & Experimental Research. 2005; 29(7):1180–1189. DOI: 10.1097/01.ALC.0000171940.95813.A5

Kivlahan DR, Marlatt GA, Fromme K, Coppel DB. Secondary prevention with college drinkers: Evaluation of an alcohol skills training program. Journal of Consulting and Clinical Psychology. 1990; 58:805–810. [PubMed: 2292630]

Lee CM, Kilmer JR, Laux D, Neighbors C, Walter T, Fairlie A, Patrick ME. Beyond the munchies: Young adult marijuana consequences and implications for brief motivational intervention research. (in preparation).

Lee CM, Neighbors C, Hendershot CS, Grossbard J. Development and preliminary validation of a comprehensive marijuana motives questionnaire. Journal of Studies on Alcohol and Drugs. 2009; 70:279–287. doi:0.15288/jsad.2009.70.279. [PubMed: 19261240]

Lee CM, Neighbors C, Woods BA. Marijuana motives: Young adults' reasons for using marijuana. Addictive Behavior. 2007; 32(7):1384–1394. DOI: 10.1016/j.addbeh.2006.09.010

Midanik LT, Tam TW, Weisner C. Concurrent and simultaneous drug and alcohol use: Resultsof the 2000 National Alcohol Survey. Drug and Alcohol Dependence. 2007; 90:72–80. DOI: 10.1016/j.drugalcdep.2007.02.024 [PubMed: 17446013]

Miech, RA., Johnston, LD., O'Malley, PM., Bachman, JG., Schulenberg, JE., Patrick, ME. Monitoring the Future national survey results on drug use, 1975–2016: Volume I, secondary school students. Ann Arbor: Institute for Social Research, The University of Michigan; 2017. http://www.monitoringthefuture.org/pubs/monographs/mtf-vol1_2016.pdf

National Institute on Alcohol Abuse and Alcoholism. Alcohol alert: Young adult drinking (Number 68). Rockville, MD: NIAAA Publications Distribution Center; 2006.

O'Connor BP. SPSS and SAS programs for determining the number of components using parallel analysis and Velicer's MAP test. Behavior Research Methods, Instrumentation, and Computers. 2000; 32:396–402. DOI: 10.3758/BF03200807

Pape H, Rossow I, Storvoll EE. Under double influence: Assessment of simultaneous alcohol and cannabis use in general youth populations. Drug and Alcohol Dependence. 2009; 101:69–73. DOI: 10.1016/j.drugalcdep.2008.11.002 [PubMed: 19095380]

Patrick ME, Schulenberg JE, O'Malley PM, Johnston L, Bachman J. Adolescents' reported reasons for alcohol and marijuana use as predictors of substance use and problems in adulthood. Journal of Studies on Alcohol and Drugs. 2011; 72:106–116. DOI: 10.15288/jsad.2011.72.106 [PubMed: 21138717]

Ramaekers JG, Berghaus G, van Laar M, Drummer OH. Dose related risk of motor vehicle crashes after cannabis use. Drug and Alcohol Dependence. 2004; 73:109–119. DOI: 10.1016/j.drugalcdep.2003.10.008 [PubMed: 14725950]

Sewell RA, Poling J, Sofuoglu M. The effect of cannabis compared with alcohol on driving. The American Journal on Addictions. 2009; 18:185–193. DOI: 10.1080/10550490902786934 [PubMed: 19340636]

Simons J, Correia CJ, Carey KB, Borsari BE. Validating a five-factor marijuana motives measure: Relations with use, problems, and alcohol motives. Journal of Counseling Psychology. 1998; 45:265–273. DOI: 10.1037/0022-0167.45.3.265

Simons J, Correia CJ, Carey KB. A comparison of motives for marijuana and alcohol use among experienced users. Addictive behaviors. 2000; 25(1):153–160. [PubMed: 10708331]

Simons JS, Gaher RM, Correia CJ, Hansen CL, Christopher MS. An affective-motivational model of marijuana and alcohol problems among college students. Psychology of Addictive Behaviors. 2005; 19:326–334. DOI: 10.1037/0893-164X.19.3.326 [PubMed: 16187813]

Stephens RS, Roffman RA, Curtin L. Comparison of extended versus brief treatments for marijuana use. Journal of Consulting and Clinical Psychology. 2000; 68(5):898–908. DOI: 10.1037/0022-006X.68.5.898 [PubMed: 11068976]

Stinson FS, Grant BF, Dawson DA, Ruan WJ, Huang B, Saha T. Comorbidity between DSM-IV alcohol and specific drug use disorders in the United States: results from the National Epidemiologic Survey on Alcohol and Related Conditions. Drug and Alcohol Dependence. 2005; 80(1):105–116. DOI: 10.1016/j.drugalcdep.2005.03.009 [PubMed: 16157233]

Subbaraman MS, Kerr WC. Simultaneous versus concurrent use of alcohol and cannabis in the National Alcohol Survey. Alcoholism: Clinical and Experimental Research. 2015; 39(5):872–879. DOI: 10.1111/acer.12698

Terry-McElrath YM, O'Malley PM, Johnston LD. Simultaneous alcohol and marijuana use among US high school seniors from 1976 to 2011: Trends, reasons, and situations. Drug and Alcohol Dependence. 2013; 133:71–79. DOI: 10.1016/j.drugalcdep.2013.05.031 [PubMed: 23806871]

Terry-McElrath YM, O'Malley PM, Johnston LD. Alcohol and marijuana use patterns associated with unsafe driving among U.S. high school seniors: High use frequency, concurrent use, and simultaneous use. Journal of Studies on Alcohol and Drugs. 2014; 75:378–389. DOI: 10.15288/jsad.2014.75.378 [PubMed: 24766749]

Velicer, WF., Eaton, CA., Fava, JL. Construct explication through factor or component analysis: A review and evaluation of alternative procedures for determining the number of factors or components. In: Goffin, RD., Helmes, E., editors. Problems and solutions in human assessment. Boston, MA: Kluwer; 2000. p. 41-71.

Volkow ND, Baler RD, Compton WM, Weiss SRB. Adverse health effects of marijuana use. New England Journal of Medicine. 2014; 370:2219–2227. DOI: 10.1056/NEJMra1402309 [PubMed: 24897085]

Yi, H., Williams, GD., Smothers, BA. Trends in Alcohol-Related Fatal Traffic Crashes: United States, 1977–2002. Bethesda, MD: National Institute on Alcohol Abuse and Alcoholism; 2004. (Surveillance Report No. 69)

Zou G. A modified Poisson regression approach to prospective studies with binary data. American Journal of Epidemiology. 2004; 159(7):702–706. [PubMed: 15033648]

Highlights

- There are distinct motives for simultaneous alcohol and marijuana (SAM) use.

- Motives for SAM use include conformity, positive effects, calm/coping, and social.

- After controlling for alcohol and marijuana motives, SAM motives were associated with use.

Table 1

Exploratory factor analysis: Four factors of simultaneous alcohol and marijuana (SAM) use motives

	Conformity	Positive effects	Calm/Coping	Social
Because others are doing it	**.60**	.03	-.17	.14
Pressure from others	**.88**	.01	.00	-.08
Looking for a new experience	**.41**	.22	.11	-.04
So I won't feel left out	**.78**	.03	-.03	.06
To fit in with a group I like	**.87**	.03	-.06	-.04
Because my friends pressure me to use	**.85**	-.13	.04	.02
So that others won't kid me about not using	**.72**	-.03	.22	-.08
To be liked	**.67**	-.06	.00	.10
To increase intoxication	.09	**.66**	-.03	-.02
Cross-faded effects are better	-.04	**.87**	-.05	-.07
To get a better high	-.02	**.79**	.03	.05
To get to a greater altered state	-.10	**.57**	.06	.16
To increase the positive effects I get from alcohol	-.03	**.68**	.11	.00
To increase the positive effects I get from marijuana	-.05	**.74**	.07	.00
To help me sleep	-.02	-.04	**.66**	.00
To calm me down	.00	.05	**.77**	.05
To cope with anxiety	-.08	.06	**.66**	.13
Because it makes a social gathering more enjoyable	.05	.32	-.16	**.55**
Because it is customary on special occasions	-.01	-.07	.15	**.70**
To be sociable	.17	.12	-.09	**.59**
Because it is what most of my friends do when we get together	.28	.06	.11	**.41**
As a way to celebrate	-.06	-.05	.11	**.64**
Because of boredom	.11	.19	.33	.02
To offset the negative effects I get from alcohol	.10	.21	.32	-.11
To offset the negative effects I get from marijuana	.23	.20	.14	.01
Using marijuana helps me to drink more alcohol	.16	.36	.13	.01

Note. **Bolded** standardized regression coefficients from the rotated factor pattern indicate that the item loaded .40 or higher. Factors were allowed to correlate. N = 286.

Table 2

Descriptive statistics and correlations for motives for alcohol, marijuana, and SAM use

Variable	Descriptive Statistics			Pearson Correlations			
				SAM Motives			
	M (SD)	Range	N	Conformity	Positive effects	Calm/Coping	Social
Alcohol motives							
Social	2.42 (0.90)	1–5	250	0.21 **	0.21 ***	0.14 *	0.36 ***
Coping	1.48 (0.64)	1–4.7	250	0.20 **	0.25 ***	0.35 ***	0.27 ***
Enhancement	2.67 (1.04)	1–5	250	0.16 *	0.32 ***	0.20 **	0.32 ***
Conformity	1.16 (0.40)	1–4	250	0.20 **	0.07	0.10	0.23 ***
Marijuana motives							
Enjoyment	3.35 (1.26)	1–5	172	−0.03	0.39 ***	0.08	0.26 ***
Conformity	1.15 (0.39)	1–3.33	171	0.51 ***	0.17 *	0.22 **	0.38 ***
Coping	1.32 (0.57)	1–3.67	172	0.20 **	0.23 **	0.39 ***	0.24 **
Experimentation	1.28 (0.69)	1–5	172	0.23 **	0.11	0.25 ***	0.10
Boredom	1.95 (0.98)	1–5	172	0.11	0.29 ***	0.17 *	0.20 **
Alcohol-related	1.26 (0.54)	1–4.33	172	0.19 *	0.22 **	0.24 **	0.24 **
Celebration	1.75 (0.90)	1–5	172	0.12	0.00	0.04	0.21 **
Altered perception	2.06 (1.20)	1–5	172	0.10	0.38 ***	0.24 **	0.36 ***
Social anxiety	1.34 (0.63)	1–4	172	0.20 **	0.29 ***	0.56 ***	0.37 ***
Low risk	1.89 (1.17)	1–5	172	0.16 *	0.21 **	0.27 ***	0.25 **
Sleep	1.64 (0.90)	1–5	172	0.00	0.12	0.39 ***	0.13
Availability	2.27 (1.12)	1–5	172	0.21 **	0.35 ***	0.10	0.35 ***
SAM motives							
M (SD)				1.37 (0.58)	1.96 (0.92)	1.43 (0.70)	1.57 (0.67)
Range				1–5	1–5	1–4	1–4.2
N				286	286	286	286

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p < .05.

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$p < .01$.

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$p < .001$.

Table 3

Alcohol motives and SAM motives predicting SAM use, drinks per week, and alcohol consequences.

Predictor	Any SAM use in the past month				Drinks per week in the past month		Alcohol consequences in the past month	
	Estimate (SE)	Wald χ^2	Odds Ratio (95% CI)	Relative Risk (95% CI)	Estimate (SE)	Wald χ^2	Estimate (SE)	Wald χ^2
Intercept	0.07 (0.83)	0.01			0.49 (0.33)	2.19	−2.10 (0.50)	17.35 ***
Age 21+ years	−0.27 (0.35)	0.58	0.77 (0.39, 1.52)	0.92 (0.69, 1.23)	−0.06 (0.14)	0.17	0.29 (0.20)	2.21
Male sex	0.30 (0.30)	1.06	1.36 (0.76, 2.42)	1.21 (0.94, 1.56)	0.63 (0.11)	31.36 ***	0.16 (0.16)	1.04
Heterosexual	−0.13 (0.36)	0.13	0.88 (0.43, 1.79)	0.95 (0.72, 1.26)	0.42 (0.14)	8.65 **	0.25 (0.20)	1.57
Student	−0.23 (0.34)	0.46	0.80 (0.41, 1.54)	0.93 (0.70, 1.23)	−0.17 (0.13)	1.68	0.30 (0.19)	2.58
Asian [a]	−0.57 (0.49)	1.34	0.57 (0.22, 1.48)	0.73 (0.43, 1.23)	−0.22 (0.19)	1.40	−0.07 (0.26)	0.08
Other race [a]	−0.01 (0.38)	0.001	0.99 (0.47, 2.07)	0.93 (0.69, 1.27)	0.06 (0.14)	0.20	−0.33 (0.21)	2.36
Parent B.A. +	−0.25 (0.34)	0.53	0.78 (0.40, 1.52)	0.89 (0.67, 1.17)	0.02 (0.13)	0.01	0.09 (0.19)	0.21
Alcohol motives								
Social	−0.24 (0.22)	1.22	0.78 (0.51, 1.21)	0.91 (0.76, 1.09)	0.16 (0.08)	3.66	0.31 (0.11)	7.90 **
Coping	−0.03 (0.37)	0.01	0.97 (0.47, 2.02)	0.98 (0.80, 1.21)	0.27 (0.13)	4.82 *	0.52 (0.18)	8.57 **
Enhancement	0.26 (0.19)	1.84	1.29 (0.89, 1.87)	1.12 (0.95, 1.32)	0.18 (0.08)	5.44 *	0.31 (0.11)	7.64 **
Conformity	0.58 (0.50)	1.38	1.79 (0.68, 4.73)	1.35 (0.99, 1.84)	−0.06 (0.17)	0.13	0.15 (0.24)	0.40
SAM motives								
Conformity	−2.17 (0.48)	20.53 ***	0.12 (0.05, 0.29)	0.36 (0.21, 0.60)	−0.46 (0.13)	13.39 ***	−0.21 (0.18)	1.42
Positive effects	0.33 (0.22)	2.31	1.39 (0.91, 2.14)	1.11 (0.93, 1.33)	0.03 (0.08)	0.11	0.02 (0.11)	0.02
Calm/Coping	0.46 (0.27)	2.85	1.59 (0.93, 2.71)	1.19 (0.98, 1.45)	0.07 (0.10)	0.43	0.05 (0.14)	0.12
Social	0.78 (0.33)	5.51 *	2.19 (1.14, 4.21)	1.30 (1.04, 1.63)	0.14 (0.12)	1.46	0.02 (0.17)	0.02

Note. For any SAM use, logistic regression was used to obtain the estimates, SE, Wald χ^2, and ORs reported here. Supplementary regression models using the Poisson distribution were conducted using procedures described by Zou (2004) to obtain relative risk, and the estimates, SE, and Wald χ^2 from those supplementary models are not shown. N = 243 for any SAM use. N = 240 for drinks per week. N = 244 for alcohol consequences.

[a] Reference = White/Caucasian.

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p < .05.

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p < .01.

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$p < .001$.

Table 4

Marijuana motives and SAM motives predicting SAM use, marijuana use frequency, and marijuana consequences.

Predictor	Any SAM use in the past month			Days used marijuana in the past month			Marijuana consequences in the past month	
	Estimate (SE)	Wald χ^2	Odds Ratio (95% CI)	Relative Risk (95% CI)	Estimate (SE)	Wald χ^2	Estimate (SE)	Wald χ^2
Intercept	−1.32 (1.30)	1.03			2.36 (0.46)	26.63***	−0.29 (0.37)	0.59
Age 21+ years	0.03 (0.47)	0.003	1.03 (0.41, 2.60)	1.06 (0.85, 1.32)	−0.05 (0.17)	0.10	−0.01 (0.14)	0.01
Male sex	−0.04 (0.42)	0.01	0.96 (0.42, 2.20)	0.98 (0.80, 1.20)	0.16 (0.16)	1.00	0.003 (0.12)	0.00
Heterosexual	0.05 (0.52)	0.01	1.05 (0.38, 2.88)	1.03 (0.81, 1.31)	0.11 (0.19)	0.33	0.05 (0.14)	0.14
Student	0.42 (0.47)	0.79	1.52 (0.60, 3.81)	1.11 (0.89, 1.39)	−0.17 (0.17)	1.05	−0.01 (0.13)	0.00
Asian[a]	−0.37 (0.71)	0.27	0.69 (0.17, 2.79)	0.92 (0.61, 1.39)	−0.01 (0.29)	0.00	0.15 (0.22)	0.46
Other race[a]	0.34 (0.54)	0.38	1.40 (0.48, 4.05)	0.98 (0.77, 1.26)	−0.14 (0.20)	0.53	−0.07 (0.15)	0.24
Parent B.A. +	0.004 (0.46)	0.0001	1.00 (0.40, 2.49)	0.97 (0.77, 1.23)	−0.25 (0.18)	1.89	0.19 (0.14)	1.83
Marijuana motives								
Enjoyment	0.25 (0.23)	1.15	1.28 (0.81, 2.02)	1.04 (0.93, 1.17)	0.05 (0.09)	0.32	0.12 (0.07)	3.10
Conformity	−0.14 (0.77)	0.04	0.87 (0.19, 3.89)	0.95 (0.65, 1.38)	−0.25 (0.27)	0.91	0.42 (0.21)	4.04*
Coping	0.83 (0.63)	1.76	2.29 (0.67, 7.82)	1.12 (0.95, 1.32)	0.22 (0.18)	1.50	0.06 (0.14)	0.20
Experimentation	−0.85 (0.40)	4.51*	0.43 (0.20, 0.94)	0.90 (0.73, 1.12)	−0.13 (0.14)	0.84	−0.20 (0.11)	3.10
Boredom	0.04 (0.28)	0.02	1.05 (0.60, 1.82)	1.03 (0.91, 1.16)	0.36 (0.11)	10.25**	0.24 (0.08)	8.39**
Alcohol-related	2.83 (0.84)	11.43***	16.96 (3.29, 87.57)	1.32 (1.11, 1.57)	−0.16 (0.17)	0.89	0.14 (0.12)	1.26
Celebration	0.07 (0.24)	0.07	1.07 (0.66, 1.72)	1.01 (0.90, 1.13)	−0.18 (0.10)	3.30	0.02 (0.07)	0.07
Altered perception	−0.43 (0.23)	3.53	0.65 (0.42, 1.02)	0.90 (0.80, 1.02)	−0.01 (0.08)	0.01	(0.06)	0.00
Social anxiety	−0.89 (0.63)	1.99	0.41 (0.12, 1.41)	0.91 (0.73, 1.12)	−0.08 (0.19)	0.20	0.13 (0.13)	0.91
Low risk	0.38 (0.26)	2.20	1.47 (0.88, 2.43)	1.09 (1.01, 1.18)	0.08 (0.08)	1.12	−0.03 (0.06)	0.28
Sleep	−0.38 (0.32)	1.47	0.68 (0.37, 1.27)	0.92 (0.82, 1.04)	0.24 (0.12)	4.22*	0.09 (0.09)	1.15
Availability	−0.25 (0.25)	0.94	0.78 (0.47, 1.29)	0.96 (0.85, 1.09)	−0.27 (0.11)	6.33*	−0.04 (0.08)	0.34
SAM motives								
Conformity	−1.71 (0.68)	6.24*	0.18 (0.05, 0.69)	0.64 (0.40, 1.03)	−0.59 (0.23)	6.74**	−0.11 (0.19)	0.38
Positive effects	−0.16 (0.30)	0.27	0.85 (0.47, 1.55)	0.96 (0.83, 1.11)	−0.02 (0.10)	0.04	0.08 (0.08)	1.08
Calm/Coping	1.09 (0.49)	4.82*	2.96 (1.12, 7.80)	1.23 (1.08, 1.40)	0.30 (0.13)	5.33*	0.21 (0.10)	4.25*

Predictor	Any SAM use in the past month				Days used marijuana in the past month		Marijuana consequences in the past month	
	Estimate (SE)	Wald χ^2	Odds Ratio (95% CI)	Relative Risk (95% CI)	Estimate (SE)	Wald χ^2	Estimate (SE)	Wald χ^2
Social	0.81 (0.45)	3.29	2.25 (0.94, 5.38)	1.21 (0.99, 1.49)	0.34 (0.17)	4.16[*]	0.01 (0.13)	0.01

Note. For any SAM use, logistic regression was used to obtain the estimates, SE, Wald χ^2, and ORs reported here. Supplementary regression models using the Poisson distribution were conducted using procedures described by Zou (2004) to obtain relative risk, and the estimates, SE, and Wald χ^2 from those supplementary models are not shown. N = 167 for any SAM use, N = 157 for days used marijuana, N = 156 for marijuana consequences.

[a]Reference = White/Caucasian.

[*]
p < .05.

[**]
p < .01.

[***]
p < .001.